CENTER FOR BEAM PHYSICS SEMINAR

"Measuring and Understanding the Momentum Aperture in a Particle Accelerator"

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Friday July 12, 2002, 10:30 AM
Albert Ghiorso Conference Room (71-264), LBNL
••• Refreshments served at 10:20 AM•••

Abstract: Particle motion in storage rings is confined by various aperture limits, the size of which restricts the performance of the ring in terms of injection efficiency, lifetime, etc. Intra-beam scattering makes particles sweep a large portion of the phase space where their motion may eventually be resonantly or chaotically excited to large amplitudes leading to collision with the vacuum chamber. Using off-momentum simulations and experiments together with Frequency Map Analysis, we could precisely correlate beam loss areas with resonance locations. The very good agreement between simulations and experiments allowed us to provide guidance for avoiding these dangerous areas. The analysis results in predictive improvements of the momentum aperture, which led to a lifetime increase of 25% at the ALS for very high bunch charge.

Biographical data and research interests: Christoph completed his master's thesis on coherent instabilities of the electron beam in ELSA (ion trapping) at the University of Bonn in 1995. He then participated in a collaboration with DESY from 1997-1999 to study the feasibility of high-energy electron cooling in PETRA+HERA. He finished his Ph.D. thesis in March 1999 on spin dynamics in ELSA (e.g. stochastic depolarizing effects during the crossing of depolarizing resonances due to synchrotron radiation). Since April 1999, he has been working as a scientist in the accelerator physics group of the ALS at LBNL, mainly on nonlinear dynamics and lattice-related studies. He is Lead Physicist of the Superbend Project at the ALS, being responsible for dynamics studies and commissioning. Other areas of work included the commissioning of the PEP-II B-Factory at SLAC (1998-2001), and studies of intra-beam scattering for the NLC damping rings (2001).